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Abstrakt:

### $\alpha$ -cyclodextrin – a weight loss agent?

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In recent years, an alarming increase in overweight, obesity and the following diseases has been observed. Unfortunately, the current pharmacological treatments lack effectiveness or display a severe side effect profile<sup>v</sup>. New improved drugs against overweight and obesity are therefore desirable. In USA and Canada,  $\alpha$ -CD is marketed as a dietary fibre and used as a weight loss supplement (Mirafit FBCx<sup>TM</sup>, Alpha-Fibe FBCx<sup>TM</sup>). Moreover, a study has shown that adding  $\alpha$ -CD to a diet resulted in greater weight loss compared to placebo<sup>ii</sup> and in another study  $\alpha$ -CD prevented weight gain<sup>iii</sup>. The underlying mechanism for  $\alpha$ -CDs possible weight loss ability is still to be accounted for. Findings from two studies show that  $\alpha$ -CD can significantly lower the post-prandial plasma glucose response after a starch-rich meal<sup>i, iv</sup>. It is therefore hypothesized that  $\alpha$ -CD inhibits the enzymatic degradation of starch, which this study aims to investigate further.

$\gamma$ -cyclodextrin ( $\gamma$ -CD) and a starch solution was chosen as substrates. The hydrolysis by porcine pancreatic  $\alpha$ -amylase (PPA) in the presence of  $\alpha$ -CD was monitored at 37°C, pH 6.5. The degradation reactions were followed over time by quantification of the amount of reducing ends as maltose equivalents. The hydrolysis of  $\gamma$ -CD revealed that the presence of  $\alpha$ -CD inhibited the enzymatic degradation in a dose-dependent manner.  $\alpha$ -CD in a molar ratio of 0.2:1 ( $\alpha$ -CD: $\gamma$ -CD) was not sufficient to inhibit the degradation, whereas  $\alpha$ -CD in a molar ratio of 1:1 showed some effect since the initial degradation rate decreased (from 4.6 mM/hour for the control (no  $\alpha$ -CD present) to 4.0 mM/hour). In ratio 5:1 the degradation rate was almost 50% less (2.4 mM/hour). Lastly, the initial degradation rates in ratio 15:1 and 20:1 were only one third (1.2 mM/hour) of what was observed in the absence of  $\alpha$ -CD. These results shows that  $\alpha$ -CD is capable of inhibiting the enzymatic degradation of  $\gamma$ -CD considerably and that there might be an upper limit to the inhibitory effect.

<sup>i</sup> Buckley, J. D., A. A. Thorp, *et al.* (2006). "Dose-Dependent Inhibition of the Post-Prandial Glycaemic Response to a Standard Carbohydrate Meal following Incorporation of Alpha-Cyclodextrin." *Annals of Nutrition and Metabolism* 50: 108-14.

<sup>ii</sup> Comerford, K. B., J. D. Artiss, *et al.* (2010). "The Beneficial Effects [alpha]-Cyclodextrin on Blood Lipids and Weight Loss in Healthy Humans." *Obesity* 19(6): 1200-4.

<sup>iii</sup> Grunberger, G., K. L. C. Jen, *et al.* (2007). "The benefits of early intervention in obese diabetic patients with FBCx<sup>TM</sup> — a new dietary fibre." *Diabetes/Metabolism Research and Reviews* 23(1): 56-62.

<sup>iv</sup> Schmid, G., H. Reuscher, *et al.* (2004). Method for reducing the glycemic index for foods. United States, Wacker-Chemie GmbH. US 2004/0161526 A1: 1-9.

<sup>v</sup> Svendsen, O. L., S. Toubro, *et al.* (2006). "Medikamentel behandling af fedme." *Ugeskrift for læger* 168(2): 163-7.